

Application Serial No. 10/589,569

REMARKS

The Office Action of July 7, 2009, the references cited therein have been carefully considered.

In this Amendment, claim 1 has been amended to overcome the Examiner's formal rejection by more clearly distinguishing between the preamble and body portion of the apparatus claims 1-6. Additionally, claim 1 has been amended to more specifically define the bus bar as being a solid bus bar having parallel flat opposite surface planes and that the conical aperture extends between the two surface planes. Moreover, new claims 7-12, corresponding to claims 1-6, respectively, but claiming the invention in method form, have been added.

Reconsideration of the rejection of claims 1-5 under 35 U.S.C. 112, second paragraph, as being indefinite is respectfully requested. As indicated above, claim 1 has been amended to differentiate between the preamble and body portions of the claim. Accordingly, with these amendments, it is submitted that claim 1 is now definite and fully complies with 35 U.S.C. 112, second paragraph. Therefore the withdrawal of this ground of rejection is requested.

The rejection of claims 1-6 under 35 U.S.C. 103 as being unpatentable over Applicants admitted prior art figure 1 (APa1) in view of the patent to Suzuki has been noted and is respectfully traversed. In rejecting the claims, the Examiner has taken the position that the APa1 discloses all of the claimed features other than that the aperture is a conical bore that is approximately perpendicular to the surface planes of the bus bar, that the apex of the conical bore is oriented toward a first surface plane of the bar, that the bore terminates in a circular aperture, whose diameter is slightly greater than the diameter of the terminal lead, at the second surface plane, and that the cone angle of the conical bore is at least 30°; that the Suzuki patent in Fig. 1 shows a soldering nest having all of the features not taught by APa1; and that consequently it would be obvious to one skilled in the art to replace the soldering nest of APa1 with the soldering nest of Suzuki in order to provide a better solder connection, and arrive at the invention defined in claim 1. This conclusion by the Examiner is respectfully traversed. It is submitted

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that one skilled in the art would not consider combining the teachings of the two references since it is not clear that a better solder connection would result. Moreover, even if the teachings of the two references were combined in the manner suggested by the Examiner would not result in the invention defined in claim 1.

The present invention as defined in claim 1 is directed to a soldering nest provided in a solid bus bar whereby the heat dissipation is improved during soldering so that the device whose lead is being soldered is not damaged by the heat applied during soldering. For this purpose, the aperture formed in the bus bar has a conical shape with a cone angle of at least 30°, with the conical aperture being oriented substantially perpendicular to the flat surface planes of the solid bus bar formed entirely of a good heat and electrically conductive material, e.g., a metal. In order to more specifically bring out the required arrangement, claim has been amended to recite that the aperture is disposed between and extends to the two parallel surface planes of the solid bus bar as clearly shown in the drawings. As a result, all surfaces of the conical bore are surrounded only by the good heat conducting material of the bus bar so that the improved soldering connections result as discussed in detail in the present application and in the "Remarks" sections of the previous Amendments. Note that the reasons for the minimum angle for the conical aperture are not simply to permit a greater quantity of solder to be added, which is **not** a problem with a bus bar, wherein there is sufficient surface area in the aperture due to the increased thickness of the bus bar, as opposed to the limited surface area of the aperture in a lead frame with its small thickness, but rather to increase the surface area for heat dissipation purposes. The differences in the heat dissipation problems of bus bars and lead frames are discussed in greater detail in the Remarks in the Amendment filed August 11, 2008, which are incorporated by reference.

Contrary to the position taken by the Examiner, the Suzuki patent is **not** concerned with solder connections to a bus bar but rather to a lead frame 1, as described in column 1, lines 27-35, which is sandwiched between resin layers or plates 2 and 3. The actual conical aperture is formed in a burring portion 4 that is part of the

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lead frame and projects downwardly and penetrates the resin layer 3. The portion 4 is not disposed between nor extends to any opposed pair of parallel surface planes as required by claim 1 as amended, particularly since no such opposed parallel surface planes are present in the lead frame arrangement of Suzuki. Accordingly, since the present invention and the APa1 are directed to an soldering nest in a solid bus bar while the Suzuki patent is directed to a soldering nest for a lead frame, and since the soldering problems, including heat dissipation mechanisms, between bus bars and lead frames are entirely different, it is submitted that one skilled in the art would not consider combining same in the manner suggested by the Examiner. Moreover, since Suzuki does not disclose a bus bar as defined in claim 1 with an aperture as further defined in claim 1, any combination of the features of APa1 and Suzuki would not result in the invention as defined in claim 1. Accordingly, it is submitted that claim 1, and claims 2-6 dependent thereon, are allowable over the cited combination of references. It is further noted that claim 6 positively recites that the bus bar is a stand-alone bus bar, i.e., there are no insulating layers disposed on the bus bar, at least adjacent the conical bore, which can hinder the heat dissipation during soldering. This is not the case in Suzuki wherein the conical projection portion 4 is surrounded by air which is an insulating material.

The rejection of claims 1-5 under 35 U.S.C. §103(a) as being unpatentable over the patent to Lynch (U.S. 4,001,490) in view of the patent to Steigerwalt et al. (U.S. 2,912,745) has been noted and is respectfully traversed.

As in the previous rejection, the patent to Lynch is directed to providing a solder connection for a bus bar, while the Steigerwalt patent is directed to providing a solder connect in a lead frame wherein the problems of heat dissipation and the heat dissipation mechanism are quite different than those involved with a bus bar as discussed above. Accordingly one skilled in the art would not consider combining same in the manner suggested by the Examiner, particularly since the teachings of the two patents are incompatible. First of all, It is again pointed out that the Lynch patent is not concerned with soldering a bus bar to a lead or terminal of an electronic component

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lead wherein rapid heat dissipation to avoid damaging the component is a problem. Rather, the Lynch patent is concerned with soldering a bus bar (10) to a substantially large area terminal post (20) extending from a circuit board, a situation in which heat dissipation is not a problem. To make the connections to the terminal (20) according to the Lynch patent, the bus bar (10) according to FIG. 6 is twisted adjacent the apertures (15) to produce or form an interference or force fit within the aperture (15) between the bus bar (10) and the terminal post (20) as shown, for example, in FIGS. 3 and 4 of Lynch and described, for example, in column 5, lines 26-48. This interference fit between the bus bar aperture (15) and the terminal post (20), creates a very small gap around portions of the post (20); and this small, uneven gap is required to hold the bus bar in place during heating and soldering. **Such a connection or interference fit as is required with the Lynch arrangement would not be possible with a conical bore through the bus bar substituted for the rectangular bore (15) of Lynch**, as suggested in the Office Action, because the conical bore with its expanding diameter would not permit holding or gripping of the bus bar in a force or interference fit as required by the teachings of Lynch. Accordingly, for this additional reason one skilled in the art would not consider providing the bus bar of Lynch with a conical bore.

Additionally, according to Lynch, the solder is applied by a solder layer (11) applied to one outer surface of the bus bar (10). To make the solder connection, the entire bus bar (10) is heated, and the solder (11) will flow, due to the contact or interference fit between the terminal post (20) and the bus bar (10), within the small gap around the post (20) in the aperture (15). However, if the aperture (15) were conical and oriented as suggested by the Examiner, there would be **no contact** between the terminal post (20) and the solder layer (11) on the surface of the bus bar, and thus no solder flow. Consequently, for this additional reason, one skilled in the art would not consider combining the teachings of Lynch and Steigerwalt.

Moreover, Steigerwalt does not teach a conical bore for a solder nest. Rather, the Steigerwalt patent teaches that in a printed circuit, the metal circuit or lead frame is provided with a metalized conical depression surrounding the punched hole for

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receiving the component terminal in order to supply additional bonding area for the solder to enable dip soldering. However, heat dissipation is not a concern; and there is no teaching that this would have any advantage, except in the case of dip soldering of circuit boards. There clearly is no teaching that the conical shape would have any benefit in a solid bus bar not used with dip soldering or where large surface areas are readily available.

Claim 1 further recites that the conical bore is located entirely between and extends to the two parallel outer plane surfaces of the bus bar. Such is clearly not the case in either Lynch or Steigerwalt.

In summary, one skilled in the art would not consider combining the teachings of the Lynch and Steigerwalt patents in the manner suggested in the Office Action since the two references are involved with the solution of different problems and different conditions, and since the respective teachings are not compatible, resulting in a poor or faulty solder connection. Accordingly, for the above-stated reasons, it is submitted that claim 1, and claims 2-6 dependent thereon, are allowable over the combination of the Lynch and Steigerwalt patents under 35 U.S.C. §103(a).

Reconsideration of the rejection of rejection of claims 1-5 under 35 U.S.C. §103(a) as being unpatentable over the patent to Adachi et al. (U.S. 5,065,283) in view of the patent to Steigerwalt et al. (U.S. 2,912,745) likewise is respectfully requested. The Remarks found in the last Amendment with regard to this ground of rejection are still pertinent and are incorporated by reference. As with the Lynch reference, it is submitted that one skilled in the art would not consider the combination suggested by the Examiner, since the result would be an inferior solder connection.

As pointed out in the Remarks of the previous Amendments, if the aperture (7) of Adachi were made conical as suggested by the Examiner, a larger volume of heated solder would be present, resulting in extended exposure of the lead to heat, since the bus bar cannot dissipate the heat as one of its sides is not cooled by air, but is heat-insulated by PC board (6). Moreover, since the heat is applied by immersing the entire bus bar in liquid solder, there is again the problem of extended heat dissipation, since

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the portions of the bus bar away from the soldering site will become heated and further decrease the speed of heat dissipation. Note further that according to FIG. 2 of Adachi, the diameter of the terminal or lead portion (42) must be only slightly smaller than the diameter of the aperture (5) in the bus bar, and soldering along the length of the lead portion or pin (42) takes place by capillary action when the bus bar is immersed in the solder. If a conical aperture is provided in the embodiment of FIG. 2, then, as required by claim 1 and as suggested by the Examiner, the larger end of the conical aperture would come in contact with the solder, which would prevent capillary action from taking place, thus resulting in an inferior connection. In this regard, note FIG. 1 of Adachi, wherein a conical opening (5) for the lead is provided and an inferior solder joint results. Accordingly, one skilled in the art would not consider making the aperture of FIG. 2 of Adachi conical, since it would be contrary to the basic teaching of the reference and would essentially result in the inferior embodiment of FIG. 1 of Adachi.

Moreover, if the bore of FIG. 2 of Adachi were made conical, as suggested by the Examiner, it would not extend between two parallel flat outer plane surfaces of the solid bus bar as required by claim 1, but rather would appear similar to the arrangement of FIG. 1 of Adachi. Moreover, the result would clearly not be a stand-alone bus bar as defined in claim 6. Accordingly, for the above-stated reasons, it is submitted that claim 1, and claims 2-6 dependent thereon, are allowable over the combined teachings of the Adachi and Steigerwalt patents.

Newly added claims 7-12 correspond to claims 1-6 respectively, but define the invention in method form. These claims contain all of the limitations of claims 1-6 and accordingly, are allowable over the cited combinations of references for at least the same reasons as those claims set forth above. Additionally, claims 7-12 positively set forth the steps of carrying out the soldering wherein the terminal lead to be soldered is inserted into the aperture from one flat surface plane and the solder and short time heat are applied from the opposite parallel flat surface plane. The recited steps of method are not taught by or rendered obvious by any of the cited references, either alone or in combination with any other of the cited references.

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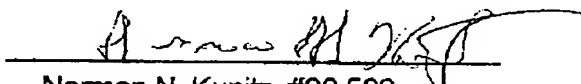
In view of the above amendments and for the above-stated reasons, it is submitted that all of the pending claims, i.e., claims 1-12, are allowable over the prior art of record and are in condition for allowance. Such action and the passage of this application to issue are, therefore, respectfully requested. It is noted that counterpart applications have been allowed in at least the European and Japanese Patent Offices.

If the Examiner is of the opinion that prosecution of this application would be advanced by a personal interview, he is invited to telephone undersigned counsel to arrange for such an interview.

Respectfully submitted,

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